

# Distribution and Ecology of the Seepage Salamander *Desmognathus aeneus* Brown and Bishop (Amphibia: Plethodontidae), in Tennessee

R. L. JONES<sup>1</sup>

*Graduate Program in Ecology,  
University of Tennessee, Knoxville, Tennessee 37916*

**ABSTRACT.**— The seepage salamander, *Desmognathus aeneus*, is found at elevations from 280 to 1000 m in the Unicoi Mountains of Polk and Monroe counties, southeastern Tennessee. It inhabits leaf litter along small streams and seepage areas. Oviposition probably occurs in late April and early May, and hatching from mid-June through mid-July. Clutch sizes range from 8 to 15 ( $\bar{x}$  = 12.2) eggs. The major prey items for Tennessee *D. aeneus* appear to be mites and collembolans.

## INTRODUCTION

Two dwarf species of salamanders in the genus *Desmognathus* occur in Tennessee. The pygmy salamander, *Desmognathus wrighti* King, is found primarily at higher elevations along the main ridge of the Unaka Mountains (Great Smokies, Bald Mountains, and Roan Mountain) on the Tennessee-North Carolina border. The seepage salamander, *Desmognathus aeneus* Brown and Bishop, has been reported from one locality in the extreme southeastern corner of the state (Harrison 1967). I here present additional information on the distribution, status, and ecology of *D. aeneus* in Tennessee. Most of my data were obtained during a 1976 study of habitat use among plethodontid salamanders in the Unicoi Mountains (Jones 1977). Supplemental information was obtained during later collecting trips and from specimens in the Vertebrate Zoology Collection, University of Tennessee, Knoxville.

## RESULTS

### DISTRIBUTION

Harrison (1967) reported *D. aeneus* from Turtletown, Polk County. Additional localities are shown in Figure 1. The species seems to occur in isolated populations throughout the Unicoi Mountains in both Polk and Monroe counties. All localities are within the Blue Ridge Physiographic Province and range from 280 to 1000 m elevation. Harri-

<sup>1</sup> Present address: Mississippi Museum of Nature Science, Jackson, MS 39202

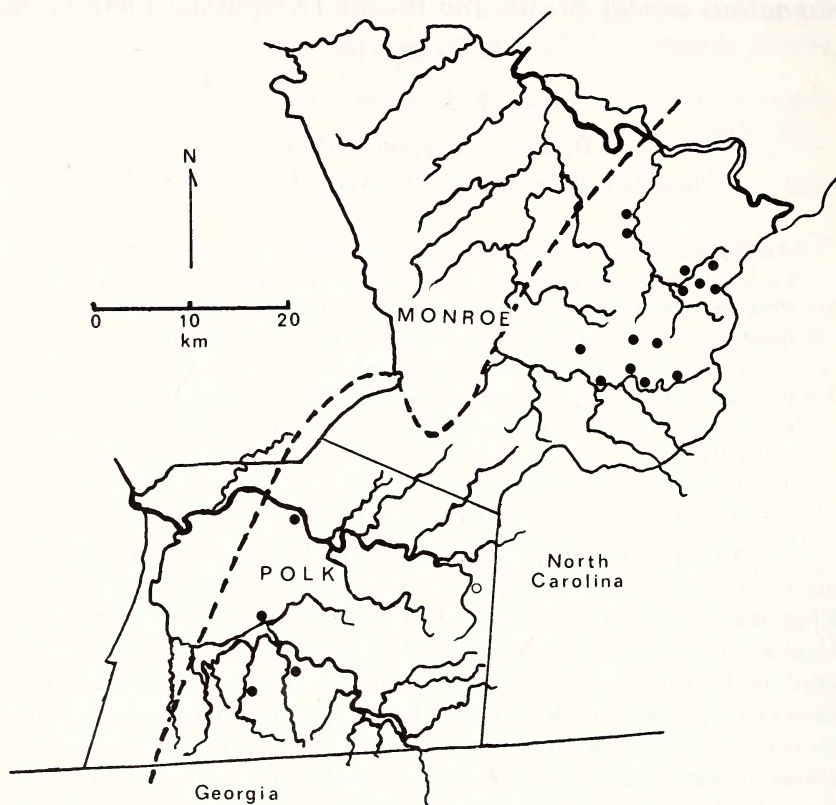


Fig. 1. Distribution of *D. aeneus* in Tennessee. Solid symbols represent localities from which specimens were examined, open symbol represents a literature record, dashed line represents approximate western boundary of Blue Ridge Physiographic Province.

son (1967) felt that the Little Tennessee River acted as a barrier to the dispersal of this species. My efforts to locate populations in the area immediately north of this river in Tennessee have been unsuccessful.

#### HABITAT

*Desmognathus aeneus* has been characterized as an inhabitant of seepages and of the leaf litter near small streams in wooded areas (Folkerts 1968). I found that the mean distance from nearest open water was 7.8 m (range 0.3-30.1 m) for 55 *D. aeneus* from the Citico Creek watershed, Monroe County, during summer 1976. Sixty percent of these were found within 5 m of streams and seepage areas (Table 1). However, specimens also can be found a considerable distance into the sur-

Table 1. Values of 3 habitat variables for 55 *D. aeneus* in the Citico Creek watershed, Monroe Co., Tennessee. Values in parentheses represent percentages of salamanders found in each habitat category.

Cover type		Substrate type		Distance from water (meters)	
Leaf litter	22(40.0)	Leaf-soil interface	22(40.0)	0-5	33(60.0)
Moss	16(29.1)	Rock-soil interface	2( 3.6)	6-10	10(18.2)
Log	11(20.0)	Leaf litter	6(10.9)	11-20	8(14.5)
Rock	6(10.9)	Log	9(16.4)	> 20	4( 7.3)
		Soil	10(18.2)		
		Rock	6(10.9)		

rounding woodland, since almost 22 percent occurred farther than 10 m from open water. Hairston (1973) also found *D. aeneus* in relatively terrestrial situations in the Nantahala Mountains of North Carolina. Both mosses and small logs were frequently used as cover objects, but I found most salamanders beneath leaf litter at the leaf-soil interface (Table 1). Canopy cover at the point of capture for the 55 specimens ranged from 60 to 90 percent ( $\bar{x}$  = 78.4%). In the Citico Creek watershed, the species seems to especially favor areas with heavy growths of *Rhododendron maximum*. The habitat requirements for *D. aeneus* in this area are most similar to those of *Eurycea bislineata* (unpubl. data), although *D. aeneus* also shares its habitat to some extent with *Desmognathus ochrophaeus* Cope, *D. fuscus* (Rafinesque), *D. monticola* Dunn, and *Plethodon glutinosus* (Green).

#### DIET

Donovan and Folkerts (1972) reported that the stomach contents of *D. aeneus* from Alabama and Georgia consisted primarily of arthropods. Insects (collembolan and dipteran larvae) and arachnids (primarily mites) were the two most frequently ingested prey types. I also found arthropods to be the most common prey items in the stomachs of 47 *D. aeneus* from the Citico Creek watershed, Monroe County (Table 2). This group comprised slightly over 95 percent of the prey items ingested and was found in almost 96 percent of the stomachs. The most frequently ingested arthropods were mites, representing about 58 percent of the total prey items and found in almost 79 percent of the stomachs. Insects, primarily collembolans, were found in almost 62 percent of the stomachs but made up only 30 percent of all prey items ingested. The composition of prey found in the stomachs suggests that *D. aeneus* does

Table 2. Stomach contents of 47 *D. aeneus* from the Citico Creek watershed, Monroe Co., Tennessee.

Category	N prey	% freq.	N stomachs	% freq.
Nematoda	2	0.8	2	4.2
Mollusca	10	4.1	8	17.0
Arthropoda	233	95.1	45	95.7
Crustacea (Isopoda)	1	0.4	1	2.1
Insecta	71	30.0	29	61.7
Collembola	40	16.3	17	36.2
Diptera	7	2.9	6	12.8
Coleoptera	5	2.0	5	10.6
Hymenoptera	4	1.6	4	8.5
Lepidoptera	2	0.8	2	4.2
Hemiptera	2	0.8	2	4.2
Insect larvae	11	4.5	9	19.1
Chilopoda	1	0.4	1	2.1
Diplopoda	3	1.2	2	4.2
Arachnida	154	62.9	38	80.8
Araneae	3	1.2	3	6.4
Pseudoscorpionida	8	3.3	6	12.8
Acarina	143	58.4	37	78.7
Unidentified arthropods	3	1.2	3	6.4

most of its foraging within the leaf litter rather than at the surface. This idea is further supported by approximately 72 hours of monitoring nocturnal activity of salamanders during both wet and dry nights in the Citico Creek watershed in 1976; no *D. aeneus* were observed active on the surface in either seepage areas of leaf litter along small streams, although they were known to be abundant in the immediate area. I have found the species crossing roads during rainstorms, but it appears to rarely leave the protection of surface cover in its habitat, an observation first noted by Folkerts (1968) for *D. aeneus* in Alabama.

#### REPRODUCTION

Folkerts (1968) found evidence for both spring and fall periods of oviposition in Alabama *D. aeneus*. He suggested that the species may deposit eggs at any time of year except mid-winter. Harrison (1967) reported egg deposition from late April to early May, but suggested that considerable variation probably occurred in the time of oviposition



from year to year. Folkerts (1968) found that clutch size varied from 5 to 17 ( $\bar{x}$  = 8.8) and that hatching in the laboratory occurred in 43 to 54 days. Harrison (1967) observed hatching from late May to early August, and reported that hatching in the laboratory occurred in 34 to 45 days. He found that clutch size varied from 6 to 18 ( $\bar{x}$  = 10.7). Eleven *D. aeneus* clutches have been found in the Citico Creek watershed. The earliest date for a clutch containing uncleaved eggs was 10 May. Clutches that were ready to hatch or hatching were observed on 23 June and 26 June, respectively. This indicates that, in Tennessee, oviposition probably occurs from late April through early May and hatching from mid-June through mid-July. I found no fall clutches. Clutch size ranged from 8 to 15 ( $\bar{x}$  = 12.2). Most of the 11 clutches were beneath moss at ground level near streams or seepage areas. However, a female attending a clutch was found beneath a small log, 1.6 m from a small stream; a second female and clutch were beneath moss on a rotting tree stump, 28 cm above ground level and 7.2 m from a stream.

### DISCUSSION

The range of *D. aeneus* in Tennessee is apparently restricted to the Unicoi Mountains of Polk and Monroe counties. Tennessee populations are probably continuous with those in western North Carolina and northern Georgia, since *D. aeneus* has been collected in counties bordering Tennessee in both states (Martof, et al. 1980; Harrison 1967).

Within the Unicoi Mountains, *D. aeneus* is an apparently widespread but relatively uncommon species. Its range in Tennessee lies primarily within the Cherokee National Forest, which should provide some measure of protection since much of this area remains relatively undisturbed. However, populations of *D. aeneus* are sensitive to drying conditions caused by clear cutting (Folkerts 1968), a common method of timber harvest in the Cherokee National Forest. Disruption by wild boar, *Sus scrofa*, of seepage area habitats is also a relatively common phenomenon within the range of *D. aeneus* in Tennessee. The apparent susceptibility of its populations to habitat destruction, coupled with its restricted distribution in the state, indicate that *D. aeneus* should be monitored for any sudden population changes in order to insure its continued survival in Tennessee.

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